CRITICAL CARE NEPHROLOGY FELLOWSHIP ATTACHMENT PROGRAMME IN SGH

Components	Information
1. Division/ Department	Medicine/ Department of Renal Medicine
2. Title of Programme	Fellowship Training in Critical Care Nephrology
3. Relevant Registrations	• Temporary Registration with Singapore Medical Council (SMC) • Training employment pass application with Ministry of Manpower, Singapore (MOM) (upon successful Temporary Registration with Singapore Medical Council)
4. Overview 4.1 Background information	Singapore General Hospital is a multidisciplinary tertiary care hospital, with over 1700 beds. Department of Renal Medicine at SGH, under Division of Medicine, caters to care of patients with acute and chronic kidney disease, acute and chronic dialysis, kidney transplant recipients and supports extracorporeal blood therapies in the intensive care units (ICU). The AKI (Acute Kidney Injury) & CCN (Critical Care Nephrology) service also takes care of patients referred for AKI by non-renal specialties. The presence of a robust electronic medical records system has allowed the development of AKI e-Alert, which helps with early diagnosis of AKI. An AKI care bundle, accessible to the ground staff, guides the immediate management of AKI, thereby minimizing time from AKI diagnosis to intervention. In addition, the electronic prescription warns against the continued dispensing of potential nephrotoxic drugs in patients with AKI. The AKI & CCN team of the Department of Renal Medicine at SGH offers comprehensive therapy options for patients with AKI. The service has access to most advanced therapies, which are adapted to accommodate patients' needs and clinical circumstances. Through collaborative efforts with the various ICU's and other departments, we are able to provide therapies like Continuous Renal Replacement Therapy (CRRT), Therapeutic Plasma Exchange (TPE), Double Filtration Plasmapheresis (DFPP), Extracorporeal Blood Purification (ECBP) for sepsis and Extracorporeal Organ Support (ECOS) in patients with liver, heart or respiratory failure. SGH shares the campus and wards with other national centers including the NHCS, NCC and Burns center. SGH is the referral center for severe burn injuries, ECMO and LVAD support. SGH is one of the two centers in Singapore that performs organ transplants, including bone marrow, liver, heart and lung transplants. This presents a unique opportunity, as the patients undergoing aforementioned procedures are at a high risk of AKI and exhibit a distinct pathophysiology and phenotype of AKI. This allows for a complete exposure to the spectrum of AKI, CCN and ECBP. The CCN and ICU faculty are well recognized regionally and internationally and possess a strong teaching background. The presence of state of the art services and facilities, and a dedicated faculty presents and ideal scenario for offering and sharing the SGH expertise with Clinical Fellows who intend to further their skills in CCN.

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4.2 Goal/ aim(s)	1. Train Clinical Fellows as a critical care nephrologist, with skills in holistic care of patients with acute kidney injury (AKI) and acute kidney disease (AKD) 2. Train Clinical Fellows to take up roles as a. leaders of CCN and acute renal replacement therapy (RRT) programmes in their institutions, and b. as educators for CCN and RRT
4.3 Duration	3 – 12 months
4.4 Hyperlinks/URL Sites	https://www.sgh.com.sg https://www.sgh.com.sg/patient-care/specialties-services
5. Target Audience	Graduate in Medicine, Nephrology, Surgery or Critical Care (including Respiratory and Critical Care Medicine, Anesthesiology)
5.1 Pre-requisite /eligibility requirement(s)	General requirements for Temporary Registration for training (required by SMC): • A basic medical degree from an accredited medical university or medical school • Passed the relevant national licensing examination in the country of conferment of basic degree, where applicable • Evidence of at least 12 months houseman-ship / internship with a certificate of satisfactory completion of houseman-ship or equivalent • Been registered as a medical practitioner in the country where he is currently practising • Been certified to be of good standing by the Medical Council or the relevant national authority Note: the doctor should be in active clinical practice for the 3 years preceding the application for medical registration. In addition to the above criteria, **Clinical Fellow** must: a) Have a minimum of 3 years of relevant working experience as a medical officer (or equivalent) b) Fulfil English Language requirements of SMC if the medium of instruction for the basic medical qualification is not in English c) Preferably have obtained a postgraduate diploma or degree in his country or overseas d) As a Clinical Fellow, the doctor will be allowed to be involved in patient care and make entries in patients' case note, communicate care plans to patients and fellow healthcare professionals, and perform procedures under <u>direct</u> supervision or Level 1 supervision **Department's requirement, if any (only for Clinical Fellow in this subspecialty):** Graduate in Medicine, Nephrology, Surgery or Critical Care (including Respiratory and Critical Care Medicine, Anesthesiology)
6. Learning Objectives	The programme aims to train Clinical Fellows in holistic care of patients with acute kidney injury (AKI) and acute kidney disease (AKD). By the completion of Fellowship, the candidate will have acquired in-depth knowledge and understanding of: 1. Identification of patients with high risk of AKI 2. Identification and management of risk factors for AKI

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	3. Early diagnosis and intervention in AKI through use of AKI e-alert, biomarkers, AKI Care Bundle etc. 4. General principles of care of critically ill patients with AKI in the ICU, intermediate care area (ICA) or general ward setting 5. Specific principles of care of managing critically in patients with AKI in different scenarios like AKI in sepsis, post-operative AKI, cardiac surgery associated AKI, AKI in liver disease, AKI in cancer patients, AKI in patients with burns, AKI in patients with mechanical cardiac devices etc. 6. Approach to fluid and medical management of AKI 7. Approach to Renal Replacement Therapy (RRT) in AKI and AKD, including Continuous Renal Replacement Therapy (CRRT), Prolonged Intermittent Renal Replacement Therapy (PIRRT), Hemodialysis (HD), Hemodiafiltration (HDF) and Peritoneal Dialysis (PD) 8. Approach to timing of initiation, choice of modality, dose, anticoagulation, monitoring and troubleshooting, and discontinuation of CRRT 9. Approach to fluid balance, antibiotic, nutrition and patient mobility management during acute RRT 10. Application of RRT in specific scenarios like complex electrolyte and acid base disorders, cerebral disorders, burns, liver disease, patients on mechanical cardiac devices etc. 11. Approach to extracorporeal blood purification (ECBP) techniques in sepsis, including use of adsorptive therapies with adsorptive CRRT filters, endotoxin and cytokine adsorptive cartridges, plasma filtration and adsorption techniques etc. 12. Principles of extracorporeal organ support (ECOS), like extracorporeal carbon dioxide removal (ECCO2R), extracorporeal membrane oxygenation (ECMO), molecular adsorbent recirculating system (MARS) etc. 13. Approach to combining RRT or RRT circuit with other extracorporeal blood therapies or circuits 14. Economics of RRT in AKI 15. Principles of non-RRT extracorporeal therapies used in critically ill patients including therapeutic plasma exchange (TPE), double filtration plasmapheresis (DFPP), Immunoadsorption (IA) etc. 16. Approach to follow up of patients with AKI in out-patient follow up clinics for patients with AKI The programme aims to train Clinical Fellows to take up roles as (a) leaders of CCN and acute renal replacement therapy (RRT) programmes in their institutions and (b) as educators for CCN and RRT. By the completion of Fellowship, the candidate will have acquired in-depth knowledge and understanding of: 1. Developing, implementing, auditing an acute RRT programme 2. Development of protocols and procedures for delivery of acute RRT, including CRRT, to provide consistent standard of care 3. Developing database or registry for AKI and RRT 4. Development of quality improvement programmes in acute RRT 5. Developing, acquiring and maintaining competency for RRT in staff 6. Developing education programmes to train staff in acute RRT 7. Understanding regulatory issues with regards to RRT machines, fluids, infection control etc.

Components	Information
7. Course/Training Syllabus	**Curriculum for AKI:** 1. Definition of AKI: RIFLE, AKIN and KDIGO definitions 2. Staging of AKI: RIFLE, AKIN and KDIGO definitions 3. AKI e-Alert and AKI care bundle 4. Epidemiology of AKI: a. Community AKI b. Hospital AKI c. AKI in critically ill d. AKI in specific scenarios: sepsis, post cardiac surgery, post-surgery, liver disease, cancer, etc. 5. Risk factors for AKI 6. Pathophysiology of AKI: vascular, inflammatory, tubular factors 7. Pathophysiology of AKI in specific scenario: sepsis, post cardiac surgery, post-surgery, liver disease, cancer, etc. 8. Making diagnosis of AKI: serum creatinine, urine output, novel biomarkers, cystatin C 9. Evaluating etiology of AKI: pre-renal, post-renal, intrinsic renal a. Urinalysis, casts, proteinuria b. Urine biochemistry including fractional excretion of sodium, urea c. Blood chemistry, infection and immunology screen d. Imaging of the genitourinary system: ultrasound, CT scan. MRI scan, doppler scan e. Role of kidney biopsy 10. Evaluation of patient of AKI: examination for signs of pre-renal etiology, sings of post-renal etiology, rash, autoimmune disease, infection etc. 11. Evaluation for complications of AKI: pulmonary edema, sever acidosis, hyperkalemia, uremic encephalopathy, pericarditis etc. 12. Management of AKI: general principles of management, fluid therapy, use of different fluids for fluid resuscitation, medical management of AKI, managing complications of AKI, identifying indications for RRT **Curriculum for CRRT:** 1. Indications for RRT initiation 2. Timing of RRT indication 3. Choice of modality: choice between intermittent and continuous RRT is a composite of multiple factors including patient hemodynamics, demand-supply ratio, potential susceptibility to rapid changes in solute and fluid fluxes, overall illness severity, potential of worsening intracranial pathology, fluid status, mobility concerns, center expertise, resources at disposal etc. 4. Choice of CRRT modality: convection, diffusion or a combination of convection and diffusion 5. Choice of pre or post filter replacement fluid and clinical implications 6. Vascular access for CRRT: internal jugular, femoral, combined to other extracorporeal therapies 7. Dose of CRRT: dose for standard indications, dose in sepsis 8. Anticoagulation for CRRT: strategies to prolong filter life with no anticoagulation, heparin, regional citrate anticoagulation 9. Initiation of CRRT: how to minimize hemodynamic effect of acute RRT

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<tr><th>Components</th><th>Information</th></tr>
<tr><td></td><td>10. Fluid balance of CRRT: how to assess and target fluid balance, how to prescribe and achieve fluid balance target (different methods)
11. Patient monitoring during CRRT
12. Monitoring CRRT circuit, alarms and troubleshooting during CRRT
13. Documenting and maintaining patient and CCRT monitoring chart
14. Modification of CRRT and changing between modalities during therapy to accommodate patient needs and clinical condition
15. Discontinuation of CRRT
16. Combining CCRT with ECMO: practical aspects of various connections, pressure monitoring and methods to manage extremes of pressure during therapy
17. Drug dosing during CRRT
18. Nutrition during CRRT: compensating for obligate losses during CRRT
19. Patient mobility during CRRT: physiotherapy during CRRT

The complete curriculum will have core curriculum for selected critical care aspects (shock, hemodynamics, fluid balance and fluid therapy etc.), pharmacology, nutrition, ECBP for sepsis, ECOS, combining CRRT with other EC therapies etc.</td></tr>
<tr><td>8. Training Method</td><td>Method of Supervision:
Direct observation and feedback. Clinical Fellow will be supervised by an assigned supervisor at all times.

Observed Only:
Clinical Fellows will have opportunities to observe the following procedures:
1. Mechanical circulatory support: Initiation of Intra-aortic balloon pump (IABP), Left ventricular assist device (LVAD), Extracorporeal membrane oxygenation (ECMO)
2. Respiratory support: Non-invasive ventilation (NIV), Mechanical ventilation (MV)
3. Cardiac surgery: Coronary artery bypass surgery (CABG), valvular heart surgery
4. Liver support: Molecular Adsorption Recirculating System (MARS)
5. Any other established or new procedure that impact training in AKI & CCN

Hands-On Experience:
Clinical Fellows will perform or assist in the following procedures under supervision:
1. Non-cuffed non-tunneled dialysis catheter insertion (Internal jugular or femoral vein)
2. Cuffed tunneled dialysis catheter insertion (Internal jugular or femoral vein)
3. Central line insertion (Internal jugular or femoral vein)
4. Arterial line insertion
5. Intubation to secure airway

<table>
<tr><th colspan="3">TRAINING ACTIVITIES & METHODOLOGY</th></tr>
<tr><th>Name of activity</th><th>Frequency / No. of sessions / Length of session</th><th>Teaching methodology</th></tr>
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Components	Information		
	Patient clinical rounds: Morning sessions	5 sessions per week (Mon to Fri): AM sessions (4 hours each) Clinical Fellows will be encouraged to attend clinical rounds on Saturdays and/or Sundays to follow up on complex or unique patients, to ensure continuity of learning.	Clinical Fellows will assist the Faculty during daily patient clinical rounds. This will train Clinical Fellows improve understanding of AKI , AKI management options and follow up of management decisions
	Patient clinical rounds: Afternoon sessions	5 sessions per week (Mon to Fri): PM sessions (1 to 2 hours each)	Clinical Fellows will assist the Faculty during daily patient exit clinical rounds or to review new referrals for AKI. This will train the Clinical Fellow improve understanding of approach to AKI , AKI evaluation and management options and follow up of management decisions
	AKI Follow up clinic	1 session per week (3 hours each)	Follow up discharged patients, who had AKI during hospitalization. This will train Clinical Fellows to understand the evolution and management of Acute Kidney Disease (AKD) and track the progression of AKI to Chronic Kidney Disease (CKD) - a serious downstream effect of AKI

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	Research	4 sessions per week - PM session (2 to 3 hours each)	The Clinical Fellow will have the opportunity to participate in AKI & CCN related research project under supervision of the programme director and faculty. Time off will be given to Clinical Fellows to conduct at least 1 research project. Clinical Fellows are encouraged to present abstracts/posters at local/regional conferences and submit manuscripts for publications. The theme of the research project will be discussed within the first month of the training programme and approval from the institutional Review Board will be obtained as per established protocol.
	Continuous Education	5 sessions per week (1 hour each)	Clinical Fellows will join the Department of Renal Medicine's structured education for Clinical Fellows and residents which include mortality and morbidity rounds, journal clubs, didactic teachings, radiology meetings and case discussions.

Components	Information
9. Assessment and Evaluation	Clinical Fellow will need to demonstrate their proficiency level based on the following competencies: **1) Patient Care** • Diagnose, stage and evaluate AKI • Identify key issues in management • Present a management plan • Identify indications, modality of renal replacement therapy • Identify anti-coagulation choices for RRT • Identify complications of RRT • Plan antibiotic management during RRT **2) Medical Knowledge** • Discuss etio-pathogenesis of AKI • Discuss evaluation of a patient with AKI • Discuss transport mechanisms in RRT • Discuss anticoagulation in RRT • Discuss rationale of ECBP **3) Practice-Based Learning and Improvement** Adapting various RRT modalities available to accommodate patients clinical condition **4) Interpersonal and Communication Skills** Communicating and discussing management plans with patients, relatives and colleagues **5) Professionalism** • Communication with colleagues • Punctuality • Mutual respect for colleagues **6) Systems-Based Practice** Collaborating with available resources including Intensivists, pharmacists, nutritionists and other paraclinical personnel to deliver efficient high level care to patients
9.1 Assessment approaches	**Formative assessment:** • Regular evaluation between Clinical Fellow and Supervisor / Head of Department • Reflective journal- logbook recordings of training activities **Summative assessment:** Periodical assessment reports as required by Singapore Medical Council **Feedback:** • End-of-training feedback form as required by Singapore Medical Council • End-of-training feedback session with SGH-PGMI

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<tr><th>Components</th><th>Information</th></tr>
<tr><td>9.2 Evaluation Process
9.2.1 General overall grading system</td><td>The general overall grading system evaluates the Clinical Fellow's performance upon completion of the fellowship programme. All Clinical Fellow will be given a general overall grading status at the end of the fellowship programme based on the grading criteria requirements incorporating the six competencies based knowledge, skills and performance that Clinical Fellow must demonstrate throughout the programme.
<table>
<tr><th>Grading Status</th><th>Description</th><th>Grading Criteria Requirements</th></tr>
<tr><td>CMP</td><td>Completes the programme</td><td>• Completes the outlined goals and objectives
• Attendance >75%</td></tr>
<tr><td>USP</td><td>Unsatisfactory performance</td><td>• Fails to complete outlined goals and objectives
• Attendance >75%</td></tr>
<tr><td>DCP</td><td>Did not complete the programme</td><td>• Attendance <75%</td></tr>
<tr><td>WDN</td><td>Withdrawn from the programme</td><td>• Exhibits unprofessional or unethical behaviour
• Refer Criteria for Early Termination</td></tr>
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<tr><td>9.2.2 Options for Clinical Fellow who was graded with a (USP) for unsatisfactory performance</td><td>To be reviewed by faculty on a case by case</td></tr>
<tr><td>9.3 Criteria for Early Termination</td><td>The attachment programme will be terminated early on the ground of the Clinical Fellow's poor performance, misdemeanour, misconduct, negligence or breach of any terms stipulated or referred to in the Fellowship Letter of Offer and Institution Terms and Conditions.

The Clinical Fellow may also request to terminate the attachment programme for reasons such as serious illness or other personal obligations.
The institution will review all requests for early termination with the Clinical Fellow and the Supervisor / Head of Department.</td></tr>
<tr><td>10. Course Administration</td><td>Type of Certification: Certificate of Training

Training Fee: S$3,210 per month</td></tr>
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Components	Information
	Programme Funding source: Self-funded
11. Number of Clinical Fellow to be accepted at any one time	3